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10.53 Scintillating fiber detectors for time evolution measurement of the triton burnup on the Large Helical Device

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Two scintillating fiber (Sci-Fi) detectors have been operated in the first deuterium campaign of the Large Helical Device (LHD) in order to investigate the time evolution of the triton burnup through secondary 14 MeV neutron measurement. Two detectors use scintillating fibers of 1 mm diameter embedded in an aluminum matrix with length of 10 cm, which connect to the magnetic field resistant photomultiplier (PMT) for signal output. A detector with 91 fibers was developed in Los Alamos National Laboratory and has been employed on the JT-60U. Another detector with 109 fibers has been developed in National Institute for Fusion Science. The signals are fed into a discriminator of 300 MHz bandwidth with pulse counter module for on-line measurement and a digitizer of 1 GHz sampling with 14 bits to acquire pulse shape information for off-line data analysis. The discrimination characteristics are evaluated by background and Co-60 gamma source. The triton burnup ratio has been evaluated shot-by-shot by the 14 MeV neutron measurement of Sci-Fi detectors which are calibrated by the neutron activation system and the total neutron measurement of the neutron flux monitor using U-235 fission chambers. The time evolution of triton burnup is investigated in different plasma configurations on LHD.

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